LOWNEYASSOCIATES
Environmental/Geotechnical/Engineering Services

Surface Soil Quality Evaluation and Screening Level Health Risk Appraisal

Watson Community Park

San Jose, CA

This report has been prepared for:

Denise Duffy & Associates

947 Cass St., Suite 5, Monterey, California 93940-4525

March 28, 2005

Project No. 1409-13

Revised May 24, 2005

Daniel W. Hernandez, C.I.H.
Senior Toxicologist

Ron L. Helm, R.G., C.E.G.
Senior Principal Geologist

Stason I. Foster, P.E.
Senior Project Engineer
Quality Assurance Reviewer

REGISTERED GEOLOGIST
RON L. HELM
No. EG1808
Exp. 7/31/05
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

TABLE OF CONTENTS

SURFACE SOIL QUALITY EVALUATION AND SCREENING LEVEL HEALTH RISK APPRAISAL

1.0 INTRODUCTION

1.1 Purpose

In this report, we present the results of the surface soil quality evaluation and screening level heath risk appraisal performed at the Watson Community Park (site) located in San Jose, California (Figure 1). This work was performed for Denise Duffy & Associates to evaluate surface soil quality and to assess potential health risks to park visitors.

1.2 Site Background and Exposure Setting

The Watson Community Park is located on Jackson Street in San Jose, California. The park includes a community center, dog park, kid's playground, picnic tables, basketball courts, soccer fields, asphalt and gravel parking lots, and Las Milpitas Community Garden. During recent excavation activities for a concrete skate park, contractors uncovered refuse materials. The City of San Jose collected samples from the excavated material. Analytical laboratory results indicated that the soil was impacted with various contaminants (table 2, stockpile samples).

Accordingly, since nearby residents using the park may potentially be exposed to chemical contaminants, if any, exposed in surface soils, at the request of the City of San Jose and Denise Duffy & Associates, additional work was undertaken by Lowney Associates to address this concern. The work included surface soil sampling at randomly selected locations to evaluate soil quality across the park and potential health risks to park visitors.

1.3 Scope of Work

The scope of work for this study was outlined in our agreement dated December 7, 2004 and included the following tasks.

- Complete a preliminary site history evaluation that included the review of readily available historic aerial photographs, topographic maps, city directories and Sanborn fire insurance maps.
- Conduct a surface soil quality evaluation including the collection of soil samples for laboratory analysis.
- Prepare a screening level health risk appraisal based on contaminants detected in surface soil at the park.

2.0 HISTORICAL REVIEW

2.1 Photograph and Map Review

To evaluate the site history, we reviewed the following.

- Aerial photographs (dated 1939, 1956, 1965, 1982, and 1993) from Environmental Data Resources, Inc. (EDR) in Southport, Connecticut.
- USGS 7.5-minute topographic maps (1953, 1961, 1968, 1973, and 1980).
- Historic Sanborn fire insurance maps (1915, 1950 and 1969) from EDR.

The above maps and photographs commonly provide historical information regarding a site including land uses and changes in development over time. Copies of these maps and photographs are presented in Appendix A. Table 1 presents a summary of our historical review.

2.2 Site

Table 1. Historical Site Observations

Period	Observations
1915	The Sanborn map shows the southernmost portion of the site as a vacant lot. A note on the upper corner of the map indicates that the city incinerator is beyond the boundary of map, but it does not indicate its extent.
1939	The 1939 aerial photograph shows orchards and row crop fields on approximately the northern half of the site, north of the easterly extension of Jackson Street. The easterly extension of Jackson appears as an unpaved road. South of this road, the site appears as irregular, hummocky topography crisscrossed by numerous trails. Between Jackson and North 22nd Street is an area with a light gray tone, contrasting with the area to the east, to Coyote Creek, which is mottled in various tones of gray, and what appear to be trees. The area south of Jackson and east of North 22nd Street could be underlain by refuse.
1950	The 1950 Sanborn map depicts only the southern most portion of the site and shows it as vacant land. There is no notation of an incinerator as on the 1915 map.
1953	The 1953 topographic map shows the site area as vacant land.
1956	The 1956 aerial photograph depicts the northern half of the site, as in 1939, with row crops and orchards. The southern half appears to have been graded since the 1939 photograph and is now depicted with smooth topography and a more uniform gray tone. A row of trees appears on the south side and along the dirt road east of Jackson. What appears to be an elongated strip of land paralleling Coyote creek extends from the dirt road to the southern portion of the site. A grass cover appears to extend between the strip and the creek.

(continued)

Table 1. Historical Site Observations
(continued)

Period	Observations
1961	The 1956 topographic map depicts the site similar to the 1953 map.
1965	The 1965 aerial photograph depicts orchards and row cops north of the dirt road east of Jackson Street. South of the dirt road appears a smooth textured area on the western half of the site. This area appears to be topographically higher than the eastern portion and has fewer trees than in the 1956 photograph. Grassland appears to extend to the east. A series of what appear to be parallel dirt strips extend between the creek and the elongated strip of land parallel to the creek in the 1956 photograph immediately south of the dirt road.
1968	There appear to be no significant changes with respect to the 1961 topographic map.
1969	The Sanborn map depicts only the southernmost portion of the site and shows it as vacant land.
1973	There appear to be no significant changes with respect to the 1961 topographic map.
1982 and 1993	The 1982 and 1993 aerial photographs depict the park similar to its current appearance.

2.3 Regulatory Agency Database Report

During this study, a regulatory agency database report was obtained and reviewed to assist in evaluating the site history and help establish whether contamination incidents have been reported in the site vicinity. A list of the database sources reviewed, a detailed description of the sources, and a radius map indicating the location of the reported facilities relative to the project site are presented in Appendix B.

Reportedly, due to the discovery of refuse during the skate park construction, the site was listed in the regulatory agency database report as Watson Park Disposal Site (identification number 1). The site was included on the Solid Waste/Landfill Sites database that contains an inventory of solid waste disposal facilities or landfills. The data comes from the Integrated Waste Management Board's Solid Waste Information System (SWIS) database.

The Watson Park Disposal Facility is identified as closed facility number 43-AN-0027 in the SWIS database. There is no information on the closure date or closure type, since the facility operated before regulations of landfills were in effect.

There were no reported nearby hazardous materials spills or releases with a potential to significantly impact the site. The potential for site impact was evaluated based on information in the database records regarding the type of release, current case status, and distance and direction from the site.

2.4 Archaeological Evaluation Report

An Archaeological Evaluation Report prepared in July 2003 by Basin Research Associates for the proposed skate park indicated that between approximately 1900 and 1930, the area of Watson Park served as San Jose's main garbage and refuse disposal area and was known as the "City Incinerator grounds". Debris consisting mostly of glass, ceramic fragments and various shellfish fragments with brick, metal, plastic, paper, etc., reportedly were observed in several places during an investigation in 1987 at the park.

3.0 SURFACE SOIL QUALITY EVALUATION

3.1 Surface Investigation

On January 20, 2005, staff geologist Andrew Matthew collected 16 soil samples (SS-1 through SS-16) at randomly selected locations from the surface to ½ foot depth, except for sample SS-9, which was collected from the 1 to 1½ foot depth beneath 1 foot of loose gravel. Sampling locations are shown on Figure 2. Soil sampling protocols are presented in Appendix D.

3.2 Soil Sample Collection and Analyses

Fifteen surface soil samples (all samples except SS-13) were analyzed at a state-certified laboratory for organochlorine pesticides (EPA Test Method 8081) and 17 California Assessment Manual (CAM) metals (EPA Test Method 6010/7000). Additionally, six soil samples (SS-3, SS-8, SS-11, SS-12, SS-13 and SS-16) were additionally analyzed for polynuclear aromatic compounds (EPA Method 8310); two samples (SS-12 and SS-13) were additionally analyzed for dioxins (EPA Test Method 8290). Sample SS-13 was not analyzed for pesticides or metals since it was collected from soil/refuse disturbed during the skate park construction; this material had already been analyzed for these compounds during initial sampling work conducted by the City of San Jose. The results obtained by the City are shown in Table 2 (stockpile samples).

Analytical results are presented in Table 2, Table 3, and Table 4. In addition, where applicable, results in these tables are compared to environmental screening level (ESL) concentrations. Copies of the analytical reports and chain of custody documentation are presented in Appendix E.

As mentioned above, Table 2 also includes analytical results for two samples (SS-1 and SS-2) collected by staff of the Department of Environmental Services of the City of San Jose on August 10, 2004. These samples were 4-point composite samples reportedly collected from two stockpiles of soil mixed with refuse material resulting from the recent excavations for a skate park at the site.

Table 2. Analytical Results of Soil Samples
Organochlorine Pesticides

(concentrations in parts per million)

Sample ID	Depth (feet)	Dieldrin	Endrin	α-Chlordane	γ-Chlordane	4,4'-DDT	4,4'-DDE	4,4'-DDD
SS-1	(0-½)	<0.01	<0.01	<0.01	<0.01	0.049	0.049	<0.01
SS-2	(0-½)	<0.02	0.029	<0.02	<0.02	0.23	0.24	<0.02
SS-3	(0-½)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
SS-4	(0-½)	<0.1	0.11	<0.1	<0.1	0.56	1.0	<0.1
SS-5	(0-½)	<0.01	<0.01	<0.01	<0.01	0.054	0.11	<0.01
SS-6	(0-½)	<0.01	<0.01	<0.01	<0.01	<0.01	0.014	<0.01
SS-7	(0-½)	0.0087	0.0058	0.0087	0.0082	0.054	0.063	<0.004
SS-8	(0-½)	<0.01	<0.01	<0.01	<0.01	0.02	0.036	<0.01
SS-9	(1-1½)	<0.01	0.014	<0.01	<0.01	0.077	0.085	<0.01
SS-10	(0-½)	<0.01	<0.01	<0.01	<0.01	0.022	0.014	<0.01
SS-11	(0-½)	<0.02	<0.02	<0.02	<0.02	0.17	0.36	<0.02
SS-12	(0-½)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
SS-14	(0-½)	<0.02	<0.02	<0.02	<0.02	0.17	0.34	<0.02
SS-15	(0-½)	<0.02	<0.02	<0.02	<0.02	0.15	0.26	<0.02
SS-16	(0-½)	<0.02	<0.02	<0.02	<0.02	0.034	0.14	<0.02
SS-1	Stockp [2]	0.023	<0.002	<0.020	<0.020	0.068	0.150	0.023
SS-2	Stockp[2]	0.017	<0.002	<0.020	<0.020	0.043	0.130	0.018
Residential ESL[1]		**0.034**	**4.1**	**0.44**	**0.44**	**1.6**	**1.6**	**2.3**

1 Environmental Screening Level (ESL), Direct Exposure Pathway: RWQCB February, 2005
2 Stockp 4-point composite from stockpile (C. of San Jose, August 2004)

Table 3. Analytical Results of Soil Samples
CAM 17 Metals

(concentrations in parts per million)

Sample ID	Depth (feet)	Antimony	Arsenic	Barium	Cadmium	Chromium	Cobalt	Copper	Lead	Molybdenum	Nickel	Silver	Vanadium	Zinc	Mercury
SS-1	(0-½)	<2.0	7.4	130	<0.5	44	11	46	35	<1.0	72	<1.0	30	66	0.078
SS-2	(0-½)	<2.0	5.4	90	<0.5	31	7.1	26	88	<1.0	49	<1.0	20	65	0.1
SS-3	(0-½)	<2.0	1.7	72	<0.5	20	4.5	14	11	<1.0	32	<1.0	13	46	0.092
SS-4	(0-½)	<2.0	7.7	150	<0.5	45	11	44	77	<1.0	72	<1.0	30	95	0.12
SS-5	(0-½)	<2.0	4.7	120	<0.5	58	13	27	52	<1.0	130	<1.0	26	64	0.23
SS-6	(0-½)	<2.0	3.2	120	<0.5	35	7.5	33	34	<1.0	56	<1.0	20	100	0.32
SS-7	(0-½)	<2.0	7.6	200	0.87	56	7.8	87	320	<1.0	81	<1.0	22	340	2
SS-8	(0-½)	<2.0	5.8	140	0.5	59	12	44	140	<1.0	120	<1.0	23	150	0.71
SS-9	(0-½)	<2.0	4.5	140	<0.5	36	8.2	30	63	<1.0	60	<1.0	25	140	0.15
SS-10	(0-½)	<2.0	6.4	170	<0.5	50	9.1	50	130	<1.0	79	<1.0	28	150	0.18
SS-11	(0-½)	22	34	490	2.6	44	9.3	430	2,200	1.9	64	4	26	1,300	0.28
SS-12	(0-½)	<2.0	2.5	90	0.55	26	3.8	30	180	<1.0	33	<1.0	14	130	0.83
SS-14	(0-½)	<2.0	6.5	140	<0.5	33	8.8	47	87	<1.0	43	<1.0	30	120	0.15
SS-15	(0-½)	<2.0	6.7	95	<0.5	66	9.5	34	56	<1.0	100	<1.0	27	88	0.057
SS-16	(0-½)	<2.0	4.6	120	<0.5	31	8.1	56	60	<1.0	42	<1.0	29	110	0.092
SS-1	Stockp[2]	27	24	940	5.3	55	12	720	3,400	<1.0	85	4.0	41	2,500	2.6
SS-2	Stockp[2]	8.7	25	910	4.9	62	13	550	3,100	<1.0	83	4.0	46	2,300	1.6
Residential ESL[1]		**6.4**	**5.5***	**1,000**	**1.7**	**23,000**	**10[Δ]**	**610**	**150**	**76**	**310**	**76**	**110**	**4,600**	**3.7**

1 Environmental Screening Level (ESL), Direct Exposure Pathway: RWQCB February, 2005
BOLD Exceeds RWQCB direct exposure ESL for residential site use
Note: Berylium, Selenium, and Thallium were not detected in any of the samples
* Cal/EPA generally does not require cleanup of soil to below background levels. Typical mean background concentrations of arsenic in Bay Area soils range from approximately 5 ppm to 20 ppm, with some soils containing up to 40+ ppm arsenic (LBNL 2002).
Δ Based on trench worker exposure; the California Human Health Screening; Level is 660 ppm (Cal/EPA January 2005).

Table 4. Analytical Results of Soil Samples Polynuclear Aromatic Compounds

(concentrations in parts per million)

Sample ID	Depth (feet)	Anthracene	Benzo (a) anthracene	Benzo (b) fluoranthene	Benzo (k) fluoranthene	Benzo (g,h,i,) perylene	Benzo (a) pyrene	Chrysene	Fluoranthene	Indeno (1,2,3-cd) pyrene	Naphthalene	Phenanthrene	Pyrene
SS-3	(0-½)	<0.017	<0.017	<0.017	<0.017	<0.033	<0.017	<0.017	<0.017	<0.017	<0.17	<0.017	<0.017
SS-8	(0-½)	0.024	0.095	<0.017	0.04	0.056	0.13	0.1	0.47	0.11	<0.17	0.4	0.43
SS-11	(0-½)	<0.017	<0.017	<0.017	<0.017	<0.033	<0.017	0.023	0.072	<0.017	<0.17	0.061	0.064
SS-12	(0-½)	<0.17	0.24	0.23	<0.17	0.37	0.42	0.26	1.4	0.42	<1.7	0.89	1.0
SS-13	(0-½)	1.6	3.5	2.4	2.0	3.7	6.3	4.5	27	8.1	10	25	19
SS-16	(0-½)	<0.017	0.017	<0.017	<0.017	<0.033	0.028	0.032	0.066	0.017	<0.17	0.041	0.054
Residential ESL[1]		**3,500**	**0.38**	**0.38**	**0.38**	**460**	**0.038**	**3.8**	**440**	**0.38**	**1.5**	**440**	**3600**

[1] Environmental Screening Level (ESL), Direct Exposure Pathway: RWQCB February, 2005

Table 5. Analytical Results of Soil Sample Dioxin

(concentrations in parts per trillion)

Dioxins	SS-12 Surface to 1/2 foot	SS-13 Surface to 1/2 foot	Residential ESL[1]
2,3,7,8-TCDF	<0.29	8.4	N/A
Total TCDF	0.40[a]	260	NA
2,3,7,8-TCDD	<0.2	0.68	4.6
Total TCDD	<0.2	25	NA
1,2,3,7,8-PeCDF	<1.0	12	NA
2,3,4,7,8-PeCDF	<1.0	36	NA
Total PeCDF	<1.0	370	NA
1,2,3,7,8-PeCDD	<1.0	4.9	NA
Total PeCDD	<1.0	45	NA
1,2,3,4,7,8-HxCDF	<1.0	28	NA
1,2,3,6,7,8-HxCDF	<1.0	31	NA
2,3,4,6,7,8-HxCDF	<1.0	52	NA
1,2,3,7,8,9-HxCDF	<1.0	7.8	NA
Total HxCDF	<1.0	370	NA
1,2,3,4,7,8-HxCDD	<1.0	3.8	NA
1,2,3,6,7,8-HxCDD	<1.0	8.9	NA
1,2,3,7,8,9-HxCDD	<1.0	6.5	NA
Total HxCDD	<1.0	100	NA
1,2,3,4,6,7,8-HpCDF	<1.0	200	NA
1,2,3,4,7,8,9-HpCDF	<1.0	15	NA
Total HpCDF	<1.0	300	NA
1,2,3,4,6,7,8-HpCDD	<1.0	84	NA
Total HpCDD	<1.0	160	NA
OCDF	<2.0	220	NA
OCDD	<2.0	430	NA

[a] Flagged as background by the laboratory (corresponded to similar blank levels)
[1] Environmental Screening Level (ESL), Direct Exposure Pathway, RWQCB, February, 2005

3.3 Surface Soil Sample Discussion

Chemicals detected in 15 surface soil samples collected and analyzed from the site were compared to the residential ESLs (direct exposure pathway), which are published by the San Francisco Bay Regional Water Quality Control Board (RWQCB). As stated by the RWQCB, the ESLs are not regulatory "cleanup standards". The presence of a chemical at a concentration above an ESL does not necessarily indicate that adverse impacts to human health or the environment are occurring; exceeding ESLs indicates that the potential for impacts may exist and that additional evaluation may be needed. A discussion of the chemicals detected is presented below. The analytical data from SS-13 and from the stockpile samples collected by the City are not presented in this section because these samples are more representative of buried refuse material than surface soil exposed to park visitors.

Organochlorine pesticides were not detected in 15 surface soil samples at concentrations exceeding residential direct exposure ESLs.

Polynuclear aromatic compounds (PNAs) were detected in 2 of 5 surface soil samples analyzed at concentrations exceeding residential direct exposure ESLs.

Antimony exceeded the residential direct exposure ESL in 1 of 15 surface soil samples; arsenic exceeded the residential ESL in 8 of 15 surface samples but only one sample appeared to exceed natural background concentrations; cadmium exceeded the residential direct exposure ESL in 1 of 15 surface samples; cobalt exceeded the residential direct exposure ESL in 4 of 15 surface samples and lead exceeded the residential direct exposure ESL in 3 of 15 surface samples. Naturally occurring background concentrations of arsenic, cadmium, chromium and other metals sometimes exceed the ESLs. Generally, regulatory agencies do not require cleanup below natural background concentrations. In some cases, the predictive risk-based models generate residential ESL levels that lie below typical background concentrations. An example is naturally-occurring arsenic in soils, which frequently has a higher concentration than the risk-based concentration set at a one-in-one-million cancer risk. A Lawrence Berkeley National Laboratory report (LBNL, 2002) presents a range of mean concentrations of arsenic in soil samples from 0.3 to 42 mg/kg. The arithmetic mean is 5.5 mg/kg, which is typically substituted for the toxicity-based, direct exposure residential ESL. After considering background concentrations in a local area, which is generally less than 10 ppm in Santa Clara County, EPA Region 9 has at times used the non-cancer Preliminary Remediation Goal (PRG) (22 mg/kg) to evaluate sites, recognizing that this value tends to be above background levels yet still falls within the range of soil concentrations (0.39 to 39 mg/kg) that equates to the EPA's acceptable cancer risk range of 1×10^{-6} to 1×10^{-4}.

Note that the soil sample SS-11 collected from the soccer field exceeded residential ESLs for the metals arsenic (34 ppm) and lead (2,200 ppm) by a higher order of magnitude than the other samples. This sample also contained antimony and cadmium above the residential ESLs. Based on these results, soils in the vicinity of boring SS-11 may be anthropogenic; further evaluation should be considered.

Dioxins are a toxic family of chemical compounds generally found in mixtures of different compounds, each compound having its own degree of toxicity. Only TCDF was detected in surface soil sample SS-12 and appeared to be representative of background concentrations.

4.0 CHEMICALS OF POTENTIAL CONCERN

Chemicals detected in 15 surface soil samples and the buried refuse material (SS-13 and the two stockpile samples collected by the City of San Jose) were initially screened to select chemicals for risk calculations. As a conservative measure, the screening process included comparison of soil concentrations to residential ESLs for direct exposure. Residential ESLs are primarily calculated assuming 30-year residential exposure via incidental ingestion, dermal contact, and inhalation of airborne chemical constituents from affected soil media. For carcinogenic chemicals, the ESL target cancer risk is 1×10^{-6}, and the ESL target hazard index for non-carcinogenic chemicals is set at 0.2. The thresholds of concern as published by Cal/EPA are an excess lifetime cancer risk of 1×10^{-6} and a hazard quotient of 1.0 for non-cancer health effects.

For screening purposes, non-carcinogenic chemicals were eliminated from further consideration if their maximum detected concentrations were below respective residential ESL concentrations. In addition, carcinogenic chemicals were eliminated from further consideration if they were infrequently detected and if the maximum concentrations detected were 1/10 or less of their respective ESL concentrations. Because of the continued use of this property as a Community Park, any chemicals eliminated using this screening process will not significantly contribute to site risks. The chemical concentrations in site soil are summarized and compared to direct exposure residential ESLs in Table 6.

Table 6. Potential Chemicals of Concern

Chemical	Frequency of Detection	Range of Detected Concentrations	Average Concentration[a]	Location of the Maximum	95% UCL[a]	Direct Exposure Residential ESLs
Soil Chemicals		(mg/kg)	(mg/kg)			(mg/kg)
Antimony	2/16	27	NC	SJ-1	NM	6.1
Arsenic	16/16	1.7 – 34	8.36	SS-11	12.1	5.5[b]
Barium	16/16	72 – 940	200	SJ-1	297	1,000
Cadmium	5/16	0.5 – 5.3	1.96	SJ-1	2.86	1.7
Chromium	16/16	20-66	43.5	SS-15	49.6	23,000
Cobalt	16/16	3.8 – 13	8.98	SS-5/ SJ-2	10.1	10
Copper	16/16	14 – 720	107.4	SJ-1	191	610
Lead	16/16	11- 3400	433	SJ-1	851	150
Molybdenum	1/16	1.9	NM	SS-11	NM	76
Nickel	16/16	32 – 130	69.9	SS-5	82.5	310
Silver	2/16	4	NC	SS-11, SJ-1	NM	76
Vanadium	16/16	13 – 46	25.6	SJ-2	28.9	110
Zinc	16/16	46 – 2500	342	SJ-1	626	4,600
Mercury	16/16	0.057 – 2.6	0.5	SJ-1	0.83	3.7
Anthracene	2/6	0.024 – 1.6	0.28	SS-13	0.81	3,500
Benzo(a) Anthracene	4/6	0.017 – 3.5	0.645	SS-13	1.8	0.38
Benzo(b) Fluoranthene	2/6	0.23 – 2.4	0.444	SS-13	1.24	0.38
Benzo(k) Fluoranthene	2/6	0.04-2	0.413	SS-13	1.21	0.38
Benzo(g,h,i,) Perylene	3/6	0.056 – 3.7	0.696	SS-13	1.91	440
Benzo (a) Pyrene	4/6	0.028 – 6.3	1.15	SS-13	3.23	0.038
Chrysene	5/6	0.023 – 4.5	0.821	SS-13	2.31	3.8
Fluoranthene	5/6	0.066 – 27	4.84	SS-13	13.78	440

(continued)

Table 6. Potential Chemicals of Concern

Chemical	Frequency of Detection	Range of Detected Concentrations	Average Concentration[a]	Location of the Maximum	95% UCL[a]	Direct Exposure Residential ESLs
Indino-(1,2,3-cd) Pyrene	4/6	0.017 – 8.1	1.44	SS-13	4.13	0.38
Naphthalene	1/6	10	1.87	SS-13	5.2	1.5
Phenanthrene	5/6	0.041 – 25	4.4	SS-13	12.71	440
Pyrene	5/6	0.054 – 19	3.43	SS-13	9.71	360
Dieldrin	2/16	0.0087- 0.023	NC	SS-7	NC	0.034
Endrin	4/16	0.0088 – 0.11	NC	SS-4	NC	4.1
a-Chlordane	1/16	0.0087	NM	SS-7	NC	0.44
g-Chlordane	1/16	0.0082	NM	SS-7	NC	0.44
DDD	1/16	0.023	NA	SJ-1	NA	2.3
DDE	14/16	0.014 – 1.0	NC	SS-4	NC	1.6
DDT	12/16	0.02 – 0.56	0.28[c]	SS-4	0.45[c]	1.6
TCDD equivalents	1of 2	40E-06	NM	SS-13	NM	4.6E-06

Table Notes: a. Average and UCL concentrations are calculated from the discrete surfical soil data set (0 – ½ feet bgs) and includes the maximum detected concentration from one of the two samples collected by the City of San Jose from the refuse area b. The arsenic ESL is based on Bay Area background concentrations. c. DDT average and UCL concentrations are total DDT compounds (DDD + DDD + DDE). NM = not meaningful. NC = not calculated. UCL = 95% upper confidence limit of the arithmetic mean concentration. UCL calculations assume that the compounds are present at ½ the detection limit for non-detect data. The City of San Jose samples (SS-1 and SS-2) indicate stockpile sample collected from refuse material.

4.1 Chemicals Selected

The metallic compounds selected for further risk evaluation include arsenic, cadmium, cobalt, copper, lead, and nickel. Organic compounds selected for further consideration include benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indino(1,2,3,cd)pyrene, chrysene, and total dioxin and DDT compounds.

4.2 Chemicals Eliminated

The metallic compounds barium, chromium, vanadium, mercury, and zinc were eliminated from further consideration since their maximum detected concentrations were below their respective residential ESL concentrations. Antimony was eliminated from further consideration due to its low frequency of detection, and molybdenum and silver were eliminated due to low frequency of detection and the low concentrations detected. Cobalt was eliminated because it was detected below the California Human Health Screen Level (CHHSL, January, 2005).

The non-carcinogenic polycyclic aromatic hydrocarbon (PAH) compounds including anthracene, benzo (g,h,i)perylene, fluoranthene, naphthalene, phenanthrene, and pyrene were eliminated from further consideration due to the low concentrations detected. With respect to the pesticide compounds detected on-site, dieldrin, total chlordane, and DDE were eliminated as potential chemicals of concern due to low concentrations detected and low frequency of detection. Endrin was eliminated due to low concentrations detected.

5.0 EXPOSURE ASSESSMENT

The following sections (5.0 through 7.0) describe the evaluation of human health risks associated with the metallic, hydrocarbon, pesticide, PAH, and dioxin compounds detected at the Watson Community Park. The general approach used to develop risk estimates was taken from the California Environmental Protection Agency (Cal/EPA) Supplemental Guidance for Human Health Multimedia Risk Assessments of Hazardous Waste Sites and Permitted Facilities (Cal/EPA 1996). Health risks for selected chemicals were calculated for a community park use exposure scenario. The methods of calculation, exposure assumptions, parameter values used, and results are described below.

Exposure assessment is the process of identifying human populations that could potentially come into contact with site-related chemicals and the route (s) of potential exposure. For risk calculations exposure assessment includes characterizing the exposure setting and identifying potentially exposed populations, identifying exposure pathways, and quantifying exposure.

Under proposed land use conditions, visitors to the park are assumed to have potential for surface soil contact. The sections below describe assumptions and exposure parameters used to evaluate potential risks to residential receptors visiting the park.

5.1 Exposure Pathways

An exposure pathway is the course a chemical takes from a source to an exposed organism. Exposure pathways include the following four elements: (1) a source; (2) a mechanism for release, retention, or transport of a chemical in a given medium (e.g., air, water, soil); (3) a point of contact with the affected medium; and (4) an exposure route at the point of contact (e.g., ingestion, inhalation). If any of these elements is missing, the pathway is considered "incomplete" (i.e., it does not present a means of exposure).

For selected chemicals, this appraisal will address inhalation of wind blown dust, dermal and ingestion exposure to chemicals in site soil.

5.2 Exposure Estimation

Exposure estimates (intakes or administered doses) are defined as the mass of a substance taken into the body, per unit of body weight, per unit of time. Exposures are quantified by calculating the dose or chronic daily intake (CDI) of a chemical using exposure assumptions and calculation methods provided in regulatory guidance. The CDI calculations quantify the fraction of soil per day coming from the contaminated source assuming that exposure only occurs during waking hours and that the site is the only contaminated area of interest.

Chemical intakes are calculated for a hypothetical exposure scenario using algorithms and exposure variables that are based on assumptions about exposure conditions. The chemical intake calculations were adapted from EPA Risk Assessment Guidance (RAGS) and the Cal/EPA Supplemental Guidance for Human Health Multimedia Risk Assessments of Hazardous Waste Sites and Permitted Facilities (Cal/EPA 1996).

According to U.S. EPA 2000a, risk assessments should present a range of exposures that describe risks to individuals in average and high-end portions of the risk distribution. In this assessment, the 95 percent upper confidence level of the arithmetic mean is chosen for exposure point concentrations to estimate the highest exposure that is reasonably expected to occur at a site, but is still within the range of possible exposures. This is referred to as the reasonable maximum exposure (RME). EPA further states that the approach to the estimation of the RME should identify the most sensitive exposure parameters. In this assessment, exposure duration, exposure frequency, and contact rates are likely to be the most sensitive parameters. The following paragraphs describe the parameters and assumptions used to calculate CDIs for each receptor.

5.3 Exposure Scenarios

5.3.1 Community Park Exposure

DTSC 1996 provides a conservative exposure scenario with which to evaluate the park use. This guidance provides a Community Park Exposure Scenario for children of ages 1 – 17 where it is assumed that children visit the park on a periodic basis from age 1 through 17 for a total exposure period of 17 years. In this scenario, a child (ages 1 through 5), is assumed to visit the park 1 hour/day, 4 days per week, for 49 weeks per year. At ages 6 through 17 (during school year weekdays), it is assumed that the child visits the park for 2 hour/day, 3 days per week, for 36 weeks per year. On school year weekends, the child is assumed to visit the park 2 hours per day, 2 days per week, for 36 weeks per year. In addition, during vacation from school, the child is assumed to visit the park 4 hours per day, 4 days per week, for 13 weeks per year. With respect to exposure parameters, the soil ingestion rate and soil adherence factor is assumed to be the same for all ages. Other exposure parameters, including body weights, breathing rates, and the surface area of exposed skin vary by age group and are summarized in Table 7 below. Exposure assumptions and parameters (by pathway) are further described below.

5.4 Exposure Assumptions By Pathway

5.4.1 Soil Ingestion

The exposure algorithm for soil ingestion is presented in Table C-1 in Appendix C. The algorithm represents incidental ingestion of surface soil as a result of direct contact with soil on hands, followed by hand-to-mouth activity (either inadvertent or associated with eating or smoking). For this exposure pathway, for chemicals of concern excepting dioxin compounds 100% absorption of the ingested contaminant is assumed. For dioxin compounds, in accordance with Cal/EPA 1996, CDI estimates incorporate bioavailability factors to correct for absorption of 2,3,7,8 TCDD equivalents between different media. For the ingestion exposure route, a gastrointestinal absorption factor of 0.8 is assigned.

5.4.2 Dermal Contact With Soil

The exposure algorithm for dermal contact Table C-2 (Appendix C) presents the method for calculating dermal dose. Dermal exposure is expressed as an absorbed dose by incorporating a chemical-specific absorption factor (ABS) into the exposure equation. Dermal absorption values for the chemicals of concern are from Cal/EPA 1996 and Cal/EPA Preliminary Endangerment Assessment (PEA) Guidance. For chemicals of concern other than dioxin compounds, this screening level appraisal does not incorporate oral slope factor and reference dose adjustments to account for “absorbed versus administered doses”.

5.4.3 Inhalation

Table C-3 in Appendix C contains the exposure algorithm for inhalation of chemical contaminants. Inhalation of wind blown ambient dusts containing chemical compounds is estimated using the particulate emission factors (PEFs) from U.S EPA 2004 and RWQCB 2003. The PEF relates the contaminant concentration in soil with the concentration of respirable particles in the air due to fugitive dust emissions from contaminated soils. The equation for calculating ambient air concentrations and the default parameters uses is presented in Appendix C to this document. For residential park exposure, the U.S. EPA default PEF value of 1.316×10^9 cubic meters per kilogram (m^3/kg) is used.

Default-breathing rates for all receptors are used. Frequency and duration of exposures are described above. In addition, 100% absorption through the inhalation route is assumed for all COCs except dioxin compounds. For dioxin compounds, a bioavailability correction factor of 2 is used to estimate the CDI for the inhalation route.

Table 7 below provides a summary of exposure parameters used in this assessment.

Table 7. Receptor Specific Exposure Parameters

Exposure Scenario	Bwt	SA (cm^2)	AF (mg/cm^2)	IR (mg/day)	BR (m^3/d)	Exposure Duration
Child[a] Aged 1-5	15	1400	0.5	200	10	81.7 days
Child[a] Age 6	21.5 21.5	1520 4970	0.5 0.5	200 200	10 10	16.6 school week days 27.1 weekend and school vacation days
Child[a] Aged 7 – 17	43.5 43.5	2050 8010	0.5 0.5	200 200	20 20	148.5 school week days 242 weekend and school vacation days

Table notes: a. Exposure factors are from CalEPA 1996, and exposure duration is calculated as total days exposed ((hrs-day/ hours awake-day) x (days/week x weeks/year) x yrs)) Bwt= body weight, SA= exposed skin surface area, AF= soil adherence factor, IR= soil ingestion rate, BR = breathing rate.

5.5 Exposure Point Concentrations (EPCs)

The concentration term (source term) in the exposure equation is meant to reflect the average concentration contacted at the exposure point or points over the exposure period (U.S. EPA 1989a). For chemicals detected in surface soils (surface to ½ foot depth) in this appraisal, the estimated 95 percent upper confidence limit (UCL) of the arithmetic mean concentration from selected discrete and composite soil samples are used to provide a range of risk estimates. Risk estimates derived from EPC assumptions are as follows:

- EPC #1: Site wide risk estimate calculated by eliminating arsenic from risk estimates since the 95 percent UCL approximates naturally occurring background concentrations. This estimate also eliminates analytical results from buried refuse material, as visitors of the park will not likely be exposed to the material.

- EPC #2: Site wide risk estimate calculated by incorporating arsenic detected in all surface soil samples. This estimate eliminates the analytical results of the buried refuse material.

- EPC #3: Site wide risk estimate calculated by incorporating arsenic detected in surface soil sample SS-11 (34 ppm) averaged over the 15 surface sample locations; the arsenic detected in the other 14 surface soil samples are assumed to be background concentrations are not incorporated into the site wide risk estimate. Buried refuse samples are not included in this estimate.

- EPC #4: Worst-case site wide risk estimate calculated by incorporating all available analytical data, including the refuse area, dioxin compound concentrations, arsenic concentrations, and the maximum concentration from the two stockpile samples collected by the City of San Jose.

6.0 TOXICITY VALUES

Toxicity values are used to quantify the relationship between the extent of exposure to a chemical and the likelihood of adverse health consequences. EPA-derived toxicity values used in risk assessments are termed slope factors and reference doses (RfDs). Slope factors are used to estimate the incremental lifetime risk of developing cancer corresponding to CDIs calculated in the exposure assessment. The potential for noncancer health effects is evaluated by comparing estimated daily intakes with reference doses (RfDs) or reference concentrations (RfCs), which represent daily intakes at which no adverse effects are expected to occur over a lifetime of exposure. Both slope factors and RfDs are specific to the route of exposure [e.g., inhalation, or ingestion (oral) exposure]. California values are used where available in this evaluation of potential health risks.

Toxicity parameters (slope factors and reference doses) used in the calculations are summarized in Table 8 below. For lead compounds, toxicity constants are generally not assigned for risk evaluation. The Bio-kinetic uptake model (Lead Risk Assessment Spread Sheet (Cal/EPA DTSC Version 7) is used to project the hazards associated with lead exposure. Briefly, the model predicts blood lead concentrations resulting from the uptake of lead from various environmental compartments, including on-site impacted soils. In Section 7.0 below, the hazards associated with lead in soil are discussed.

Table 8. Chemical Specific Toxicity and Dermal Absorbance Factors

Chemical	ABS	SFi (mg/kg-day)$^{-1}$	Sfo (mg/kg-day)$^{-1}$	RfDo (mg/kg-day)	RfDi (mg/kg-day)
Arsenic	.03	12ca	9.45ca	0.0003	NA
Cadmium	0.001	15ca	0.38ca	0.0005	NA
Copper	.01	NA	NA	0.04	NA
Nickel	0.01	0.91ca	NA	0.02	NA
Benzo(a)anthracene	0.15	0.39ca	1.2ca	NA	NA
Benzo(b)fluoranthene	0.15	0.39ca	1.2ca	NA	NA
Benzo(k)fluoranthene	0.15	0.39ca	1.2ca	NA	NA
Benzo(a)pyrene	0.15	3.9ca	12ca	NA	NA
Chrysene	0.15	0.039ca	0.12ca	NA	NA
Indino (1,2,3-cd) Pyrene	0.15	0.39ca	1.2ca	NA	NA
DDT (t)	0.05	0.34ca	0.34ca	0.00005	0.00005
Total 2,3,7,8 TCDD Equivalents	See note below	1.56×10^5ca	1.56×10^5ca	NA	NA

Table notes: ca = California value. SFi= inhalation slope factor. SFo = oral slope factor. RfDo = oral reference dose. RfDi = inhalation reference dose. NA= not available, not applicable. Unless otherwise stated, all slope factors are from California and reference dose parameters are from U.S EPA 2004 PRGs. TCDD Note: See section 4.4 for bioavailability correction factors

7.0 RISK CHARACTERIZATION

Exposure point concentrations, represented by the site wide 95 percent UCLs, were used to calculate chronic daily intakes (dose). The resultant doses, for the exposure conditions examined were then multiplied by slope factors for carcinogenic risks or compared to reference doses for non-carcinogenic hazards. Estimated risks and hazards are summarized in Table 9 below and detailed hazard calculations by pathway and chemical are presented in Risk Presentation Tables presented in Appendix C.

A 1×10^{-6} cancer risk represents a one-in-one-million additional probability that an individual may develop cancer over a 70-year lifetime as a result of the exposure conditions evaluated. Because cancer risks are assumed to be additive, risks associated with simultaneous exposure to more than one carcinogen are aggregated to determine a total pathway cancer risk. Total cancer risks are summed to determine the total cancer risk for the population of concern.

Unlike carcinogenic effects, non-cancer effects are not expressed as a probability. Instead, these effects are expressed as the ratio of the estimated exposure over a specified time period to the RfD derived for a similar exposure period. This ratio is termed a hazard quotient. If the CDI exceeds the RfD (i.e., hazard quotient greater than 1), there may be concern for non-cancer adverse health effects. Exposures resulting in a hazard quotient that is less than unity are unlikely to result in non-cancer adverse health effects. Hazard quotients for individual chemicals are conservatively summed for each exposure pathway to determine a hazard index (HI).

7.1 Risk Estimates

Assuming that a community park receptor is exposed to surface soils for 17 years, risk estimates range from 1.5×10^{-6} to 3.6×10^{-5}, depending upon the EPCs used in the calculations. Risk estimates for each EPC assumption described in Section 5.5 are summarized in Table 9 below.

Table 9. Risk Estimates by Exposure Point Concentration Assumptions

EPC Assumption	Risk	Hazard
#1	1.5×10^{-6}	0.01
#2	1.9×10^{-5}	0.03
#3	5.1×10^{-6}	0.01
#4	3.6×10^{-5}	0.04

If the refuse is appropriately capped with clean material (EPC Assumption #1), users of the park will not be exposed to the buried refuse. Under this scenario, the excess carcinogenic risk is estimated at 1.5×10^{-6}, which is near the cal/EPA target risk level of 1.0×10^{-6} or one in a million. This estimate assumes that the 95 percent UCL for arsenic (the calculated exposure point concentration) is typical of natural background concentrations, and arsenic can be eliminated as a chemical of concern. This estimate also excludes the analytical results from the sample collected from the temporarily exposed refuse that was subsequently covered by gravel at the skate park. We assumed that the refuse buried at the park will be entirely capped with clean material, and users of the park will not encounter this material.

If the lead and arsenic detected in sample SS-11 (EPC Assumption 2) are indicative of random areas of refuse exposed at the surface, or surface soil being impacted by another source, the excess carcinogenic risk increases to approximately 1.9×10^{-5}. This increased risk is primarily driven by adding the arsenic reported from the analyses of all samples (except the refuse samples) into the risk calculation; arsenic originally was excluded from the initial risk estimate discussed above.

If we assume arsenic was detected at natural background concentrations in all samples (95 percent UCL at 6.2 ppm) except for SS-11 and refuse samples, and average the arsenic detected in surface soil sample SS-11 with the other surface samples (34 ppm average over 15 locations) (EPC Assumption #3), the excess carcinogenic risk reduces to approximately 5.1×10^{-6}.

For a worst case scenario (EPC Assumption #4), we assumed that refuse is exposed at the surface in other areas of the park in similar form and substance as detected in the samples of the buried refuse material collected by the City. Thus, under this conservative scenario we assume that the refuse data collected are representative of surface soil conditions. Under this assumption, the excess carcinogenic risk increases to approximately (3.6×10^{-5}) due to the presence of PAHs, dioxins and arsenic.

These risks appear generally within the range found acceptable by the Cal/EPA and the USEPA: 1 in a million (1×10^{-6}) and 1 in a million (1×10^{-6}) to one in ten thousand (1.0×10^{-4}), respectively. Additionally, the estimated excess carcinogenic risks discussed above are generally in the range of the Proposition 65 "no significant risk level", which is defined as the level of exposure that would result in not more than one excess case of cancer in 100,000 individuals (1×10^{-5}) exposed to the chemical over a 70-year lifetime.

With respect to lead, the Cal/EPA DTSC uptake model in default mode, where residential exposure assumptions are incorporated (a much more conservative exposure scenario than a park setting), produces a blood lead concentration for a child receptor (99^{th} percentile) of 22.8 micrograms per deciliter (ug/dl). This result is above the target level of 10 ug/dl. Please note that the Cal/EPA DTSC model does not have a less conservative exposure scenario, an exposure scenario similar to park use. Thus, the hazard associated with lead detected in the park's surface soil appears unacceptable under a residential scenario due to the elevated concentration (2200 ppm) detected in SS-11. Please note that this lead concentration also exceeds California's hazardous waste standard (1000 ppm). We recommend further sampling near SS-11 to evaluate if the elevated lead (2200 ppm) and arsenic (34 ppm) detected in this sample are anomalies, related to refuse exposed at the surface, associated with another source, or representative of background conditions (for arsenic only). Appendix-A presents the output of the Lead Risk Assessment Spreadsheet.

8.0 CONCLUSIONS AND RECOMMENDATIONS

The available historical aerial photos and the regulatory database reviewed indicate that undisclosed quantities of refuse may have been disposed across a significant portion of the park. We recommend that the lateral and vertical extent of refuse be defined. In addition, we recommend that the characteristics of the refuse be determined. This evaluation could be performed through file reviews, if available, at local and state overseeing regulatory agencies and/or by site sampling. Depending upon the type of debris buried at the site, an evaluation of off-gassing contaminants, such as methane gas, may also be warranted since occupied structures appear to be within 1000 feet of the refuse. We also recommend evaluating the soil type, thickness and integrity of the soil that has been placed across the refuse.

Based on the screening level health risk appraisal, there appears to be no immediate human health risk to park visitors. However, we understand that the City of San Jose has implemented interim remedial measures to protect public health by fencing the general area. In addition, refuse material previously exposed during construction activities has been reportedly appropriately disposed off-site, and the area capped by gavel.

We recommend contacting the city attorney to determine if the information presented in this report should be disclosed to an overseeing regulatory agency and/or the users of the park.

A soil management plan also should be developed. This plan would present the protocols for handling refuse material in the event that it is exposed during future construction or park maintenance activities.

9.0 UNCERTAINTY AND LIMITATIONS

This report was prepared for the sole use of Denise Duffy & Associates and the City of San Jose in evaluating surface soil quality at the Watson Community Park at the time of this study. We make no warranty, expressed or implied, except that our services have been performed in accordance with environmental principles generally accepted at this time and location. The chemical and other data presented in this report can change over time and are applicable only to the time this study was performed. We are not responsible for the data presented by others.

The accuracy and reliability of geo-chemical studies are a reflection of the number and type of samples taken and extent of the analyses conducted, and are thus inherently limited and dependent upon the resources expended. Chemical analyses were performed for specific parameters during this investigation, as detailed in the scope of services. Please note that additional constituents not analyzed for during this evaluation may be present in soil and ground water at the site. Our sampling and analytical plan was designed using accepted environmental principles and our judgment for the performance of a surface soil quality evaluation and was based on the degree of investigation approved by you. It is possible to obtain a greater degree of certainty, if desired, by implementing a more rigorous soil, soil vapor and ground water sampling program.

The primary uncertainties associated with the screening level risk estimates are related to assumptions concerning the degree of soil contact, the intentional or unintentional elimination of chemicals of concern, exposure point calculations, and site characterization. With respect to soil contact, future site improvements, if any, may preclude significant soil contact by residential receptors. The degree of soil contact will largely depend upon the nature and aerial extent of landscape improvements, and the nature of activities conducted upon the improvements. As an example, gardening in soil and playing on exposed soil could imply a higher degree of soil contact than that associated with playing soccer on a grass field. This assessment conservatively assumed a high soil ingestion rate for all ages, which in turn likely results in an overestimation of chemical intake thus overestimation of risks.

There is considerable uncertainty associated with chemicals of concern evaluated in this appraisal. We note that significant concentrations of dioxin related compounds were detected in the refuse material. Risk estimates for these compounds incorporate a single point estimate, which may over estimate site wide conditions. We also note that the highest concentrations of PAH compounds were detected in the refuse material, and PAHs that were detected in the refuse material were also detected in a much more limited extent in surface samples. PAH compounds typically form during the burning of oily residues. The extent of dioxin contaminant impact is currently not known. The elimination of dioxin compounds from risk estimates may cause an underestimation of risk.

Finally, there are uncertainties associated with the detection of elevated concentrations of metallic compounds in surface sample SS-11. The lateral and vertical extent (size of the "hotspot") of metallic impact is unknown. "Hot spot" concentrations can skew the data resulting in elevated exposure point concentrations, elevating risks. However, given the sample density of 15 samples over a relatively large area of 26 acres, one cannot discount that additional "hot spots" could exist, which would result in risks being understated.

10.0 REFERENCES

Cal/EPA 1996. Supplemental Guidance for Human Health Multimedia Risk Assessments of Hazardous Waste Sites and Permitted Facilities. August 1996. California Department of Toxic Substances Control, Sacramento, CA.

Cal/EPA 1999. Preliminary Endangerment Assessment Guidance Manual. June 1999. State of California Environmental Protection Agency, Department of Toxic Substances Control, Sacramento, CA.

Gilbert 1987. R.O.Gilbert. Statistical Methods for Environmental Pollution Monitoring.

RWQCB 2003. Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater. Volume 1: Summary Tier I Lookup Tables, Interim Final. July 2003 (updated 2/04/04). San Francisco Bay Region, Regional Water Quality Control Board.

U.S. EPA. 1989a. Risk Assessment Guidance for Superfund: Human Health Evaluation Manual Part A. Interim final report. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, DC.

U.S. EPA. 1989d. Exposure Factors Handbook. EPA/600/8-89/043. U.S. Environmental Protection Agency, Office of Health and Environmental Assessment, Washington, DC.

U.S. EPA. 1991a. Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual Supplemental Guidance: Standard Default Exposure Factors. Interim Final Report. OSWER Directive 9285.6-03. U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Washington, DC.

U.S. EPA 1997. Exposure Factors Handbook Volume I. United States Environmental Protection Agency, Office of Research and Development.

U.S. EPA 2004. Region IX Preliminary Remediation Goals (PRGs). United States Environmental Protection Agency, Technical Support Section, San Francisco, CA.

U.S. EPA. 2000a. Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment), Interim. EPA/540/R-99/005. Office of Solid Waste and Emergency Response, Washington, DC

Basin Research Associates. 2003. Archaeological Evaluation Report.
Watson Park Skate park, Jackson Street at North 22nd Street, City of San Jose, Santa Clara County.

EDR. 2005a. The EDR Aerial Photography Print Service, Watson Park, East Jackson / 22nd Street., San Jose, California 95112

__________ 2005b. The EDR-City Directory Astract, Watson Park

__________ 2005c. The EDR Radius Map with Geo check, Watson Park

__________ 2005d. Sanborn map Report, Watson Park

__________ 2005e The EDR-Historical Topographic Map Report, Watson Park